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Relationship between HBV DNA load and levels of serum HBsAg in patients with chronic hepatitis B

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Abstract. – OBJECTIVE: This study aims to investigate the relationship between HBV DNA load and levels of serum HBsAg in patients with chronic hepatitis B (CHB).

PATIENTS AND METHODS: Between April 20013 and July 2015, serum samples were collected from 124 CHB patients. Levels of serum HBsAg was determined using chemiluminescent immunoassay and HBV DNA load was measured using quantitative fluorescent RT-PCR (qPCR). Pearson's correlation analysis was performed to analyze the relationship between HBV DNA load and levels of serum HBsAg.

RESULTS: Serum HBsAg levels were significantly higher in the group with HBV DNA > 1×103 copies/ml than the group with HBV DNA < 1×103 copies/ml (t=5.983, p=0.000<0.05). One hundred samples with HBV DNA > 1×103 copies/ml were further divided into three subgroups based on HBV DNA load, including group A (levels of serum HBV DNA between 1×103- 1×105 copies/ml), group B (1×105- 1×107 copies/ml) and group C (> 1×107 copies/ml). Levels of serum HBsAg increased with increasing load of HBV DNA. HBsAg levels were the highest in group C and the lowest in group A with significant differences between groups (p<0.05). Pearson's correlation analysis revealed that levels of serum HBV DNA were positively correlated with levels of serum HBsAg (r=0.657, p=0.000<0.05).

CONCLUSIONS: HBV DNA load has a certain correlation with levels of serum HBsAg in CHB patients. The combination of HBV DNA load assessment and measurement of serum HBsAg levels can accurately determine HBV infection condition, help with the selection of optimal therapy and predict prognosis.

Key Words:
Chronic hepatitis B, Serum HBsAg, HBV DNA load.

Introduction

Replication of hepatitis B virus (HBV) is usually analyzed by assessing a few HBV markers such as HBV surface antigen (HBsAg) and HBV DNA load. Hence, the significance of serum HBsAg assessment for the evaluation of antiviral therapy has been attracting increasing attention[1-3]. In the present study, levels of serum HBV DNA and serum HBsAg were measured in patients with chronic HBV (CHB) infection to analyze the correlation between HBV DNA load and HBsAg levels.

Patients and Methods

Patients

Between April 2013 and July 2015, serum samples were collected from 124 patients with CHB infection admitted to our institution. Of these patients, 93 (75.0%) were males and 51 (25.0%) were females with an age range of 18-75 years and a mean age of (43.2±4.36) years. All patients met the diagnostic criteria of CHB[4].

Methods

In the present study, no patient was treated with antiviral therapy. Quantification of serum HBsAg was performed by chemiluminescent immunoassay, and HBV DNA levels were measured by fluorescent quantitative RT-PCR (qPCR)[5,6].

Statistical Analysis

Data analyses were performed using SPSS version 18.0 (SPSS Inc., Chicago, IL, USA). Quantitative data were expressed as mean ± SD. Differences between groups were analyzed using independent t-test. Pearson's correlation was used to analyze the relationship between data. p<0.05 was considered statistically significant.

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Table I. Comparison between various HBV DNA load and levels of serum HBsAg.

Levels of serum HBV-DNA (copies/ml)	n	Levels of serum HBsAg (log10IU/ml)	t	p
>1×10³	100	3.32±0.83	5.983	0.000
<1×10³	24	2.17±0.91		

Results

Comparison between various HBV DNA load and levels of serum HBsAg

Serum samples of CHB patients were divided into two groups based on serum HBV DNA levels, one group with HBV DNA levels > 1×10³ copies/ml (n=100) and the other group with HBV DNA < 1×10³ copies/ml (n=24). Serum HBsAg levels expressed as log10 IU/ml were significantly higher in the group with HBV DNA > 1×10³ copies/ml than the group with HBV DNA < 1×10³ copies/ ml (t=5.983, p=0.000<0.05) (Table I).

Analysis of levels of serum HBsAg in subgroups of samples with various HBV DNA levels

One hundred samples with HBV DNA > 1×10³ copies/ml were further divided into three subgroups based on HBV DNA load, including group A (levels of serum HBV DNA between 1×10³- 1×10⁵ copies/ml), group B (1×10⁵- 1×10⁷ copies/ml) and group C (>1×10⁷ copies/ml). Results showed that levels of serum HBsAg increased with increasing load of HBV DNA. HBsAg levels were the highest in group C and the lowest in group A with significant differences between groups (p<0.05) (Table II).

Correlation between serum HBsAg level and HBV DNA level

Pearson's correlation analysis revealed that levels of serum HBV DNA were positively correlated with levels of serum HBsAg (r=0.657, p=0.000<0.05).

Table II. Analysis of serum HBs Ag levels in subgroups with various HBV DNA load.

Groups	n	HBsAg levels (IU/ml)	p
Group A	27	2665.23±231.23	0.000
Group B	31	7568.43±333.47	0.000
Group C	42	22345.68±547.51	

Discussion

HBV infection is developed through sustained replication in the host. HBV DNA, which harbors HBV genes, is the template for gene transcription and replication. Hence, relevant studies have shown that HBV replication and infection are the most important and most direct etiological evidence for HBV[7]. However, objective indicators are still missing for dynamic monitoring, disease evaluation and medication application in patients with undetectable HBV DNA levels. Currently, quantification of serum HBsAg levels in CHB patients has been attracting attention widely[8]. In the present study, correlation analysis was performed between HBV DNA load and levels of serum HBsAg in an effort to ameliorate the evaluation of CHB progression.

HBsAg, which is a membrane protein of HBV envelope, is not infectious but can play important roles in HBV infected-hepatocytes. HBsAg can be detected in the serum of patient one week after HBV infection and coexist with HBV. Hence, HBsAg can serve as serological markers for HBV infection[9]. HBsAg can be detected in patient serum during different phases of infection, including immune tolerance phase, CHB phase (i.e. immune clearance phase), inactive carrier phase and reactive phase, as well as in HBV-infected patients, some cirrhotic patients and patients with hepatocellular cancer (HCC)[10]. A relevant study has demonstrated that serum HBV DNA load is positively correlated with levels of HBsAg, and serum HBsAg can reflect the extent of viral activity in the host as well as viral replication and extent of disease progression[11].

Results of this study showed that levels of serum HBsAg gradually increased with the increasing load of HBV DNA in CHB patients with statistical significance (p<0.05), indicating that levels of serum HBsAg are associated with HBV DNA load. In addition, this finding also suggests that levels of serum HBsAg can reflect viral activity in the host, which is consistent with the results of relevant studies. A

certain study showed that HBeAg is positive and HBV DNA reach >2×10^{7}copies/ml in the host with HBsAg titer >15000 IU/ml with 100% of sensitivity and specificity[12]. This finding implies that HBV DNA positivity is easier to be detected in patients with higher levels of serum HBsAg than those with lower levels[13].

In recent years, research on the implication of changes in levels of serum HBsAg has become a hot spot and a challenge of international academic studies. A relevant study[14] demonstrated that variations in levels of serum ABsAg have a certain correlation with variations in intrahepatic HBV DNA load. Pretreatment evaluation of baseline HBsAg levels is superior over assessment of intrahepatic HBV DNA in reflecting the efficacy of therapy and virological response. HBsAg clearance and seroconversion is considered as an important goal of HBV treatment. However, this goal is often difficult to be accomplished. Therefore, some study reported that reduction in HBsAg levels to a certain extent is considered as a predictor for better prognosis whereas complete clearance of HBsAg indicates a complete cure[15].

Conclusions

The present study shows that HBV DNA load has a correlation with levels of serum HBsAg in CHB patients and levels of serum HBsAg can accurately reflect levels of HBV DNA replication. Therefore, HBsAg levels can serve as an indicator for evaluating the efficacy of HBV treatment. Moreover, the combination of assessment of HBV DNA load and levels of serum HBV can accurately determine infection condition of HBV, HBV replication and severity of infection, thereby assisting in the selection of optimal therapy. In addition, these assessments can effectively evaluate the efficacy of antiHBV therapy and predict prognosis, thereby further application in clinical practice being warranted.

Conflicts of interest

The authors declare no conflicts of interest.

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